

## Promoting Neurocognitive Development in Childhood

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## Содействие нейрокогнитивному развитию в детском возрасте

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**Abstract.** The main psychological aspects in promoting holistic health are related to attention, care and love within the relations. It all starts in early childhood when important bonds are built between parents and child. This bond will constitute this baby as a human being who will internalize the world as it is presented to him transforming objectivity into subjectivity. This work is based on the Social Historical theory founded by Luria, Vygotsky and Leontiev, who established that psychology would provide means to acknowledge how a natural process connected to a cultural process can produce the superior mental functions. It uses didactically the principles of mediation and zone of proximal development. Considering that relations are the key for this development of superior mental functions it is important to orientate parents, teachers and community itself so that conditions are provided, with knowledge and conscience, for this development to occur. When you are present in a relation nervous connections are promoted. Results are observed qualitatively focusing that each person is an individual self and that relationships are essential to produce development. Interactions between the brain and the formation of mental functions require the maturity of the nervous system as well as an active process which emphasizes relations of two or more human beings.

Therefore, the most important is not what to do but how to do. The brain grows better within a stable environment of support and low levels of stress. Affirms that safe relations are the key to healthy growth of the brain as well as emotional regulation that stimulates learning and adaptation to reality.

**Keywords:** *relationship; bond; development; psychology; children; zone of proximal development; brain; learning disabilities; social historical theory*

**Аннотация.** Основными психологическими факторами, способствующими комплексному здоровью, являются внимание, забота и любовь близких людей. Формирование основ здоровья начинается в раннем детстве, когда закладывается связь между родителями и ребенком. Эта связь формирует ребенка как личность; ребенок видит мир глазами близких ему людей, превращая объективную реальность в субъективную. В основе данной статьи лежит социально-историческая теория, разработанная А. Р. Лурия, Л. С. Выготским и А. Н. Леонтьевым; они установили, что психология предоставляет средства для понимания того, как естественные процессы в совокупности с культурными могут порождать высшие психические функции. Дидактическими основаниями являются принципы опосредствования и зоны ближайшего развития. Изучение взаимоотношений является ключевым фактором для развития высших психических функций у ребенка; необходимо профессионально и грамотно скоординировать взаимоотношения между родителями, учителями и обществом таким образом, чтобы сформировать условия для этого развития. Когда человек находится во взаимоотношениях, формируются его нервные связи. В статье дается качественный анализ результатов исследования, акцент делается на индивидуальность каждого человека и на то, что взаимоотношения необходимы для развития. Основой установления связей между мозгом и формированием психических функций является зрелость нервной системы и активный процесс, который включает в себя взаимоотношения между двумя и более людьми. Соответственно, наиболее важным представляется не то, что нужно делать, а как это нужно делать. Мозг формируется лучше в условиях стабильной поддержки и низкого уровня стресса, поэтому безопасные взаимоотношения являются залогом здорового развития мозга и эмоциональной регуляции, которая стимулирует развитие познавательной способности и адаптации к действительности.

**Ключевые слова:** *взаимоотношение; связь; развитие; психология; дети; зона ближайшего развития; мозг; нарушения обучаемости; социально-историческая теория*

## Introduction

The main preventive measures to promote holistic health and enhance neurocognitive development are related to primary attention, care and love within the relations. It starts in early childhood when important bonds are created between parents and child. Relation is a key aspect on the promotion of holistic health. It effects the regulation of strong

emotions and the social, cognitive and behavioral spheres, in this way it is fundamental for the global development in childhood.

Vygotsky (1962/1994) states that man constitutes himself within social interactions. Relations will constitute this person as a human being who will internalize the world as it is presented to him transforming objectivity, the external world, into subjectivity, the internal world.

The author explains this when he affirms that instruments, actions and social relations are presented to the child, in first hand, in an interpsychological and social level, which involves the insertion into the cultural context and a cooperative behavior and only afterwards, it will occur in an intrapsychological, internal and subjective level through the process of internalization.

This work is based on the Social Historical theory founded by Luria, Vygotsky, and Leontiev, who established that psychology provides means to acknowledge how a natural process connected to a cultural process result in the acquisition of the superior mental functions: attention, memory, psychomotricity, language, perception and executive functions — goals, planning, organization, initiative, focus, perseveration, monitoring, flexibility, inhibition, regulation and the solving of problems. All of these functions are based on the baby's interaction with the environment as well as his capacity to absorb the world's stimulation by all the sense organs. So, it is very important for the human development to have someone to interact with this baby and be very concerned on how this interaction will occur. How a person who knows more, an adult or another older child, will interact with the baby, regardless if there is or is not any kind of compromise or impairment in the baby's capacity to connect, hear or see. All of this interaction is made when in relation with this significant Other who will show the world and the culture to the baby, it will happen by means of language which will be transmitted in different ways: language, body language, voice timbre and others.

Glozman (2014), affirms that there is always a way to stimulate, even if we talk about very serious damage, there are ways to work with the potential capacities, we can always do something. In the case of impairment such as a brain damage, we can work with the child as well as when we have limitations due to vision and hearing. Of course, there will be difficulties, but if professionals are able to orientate and propose to parents, caregivers and teachers to stimulate the child, certainly this will be a very important form of intervention, fundamental in terms of prevention as well as development.

Both development and overcoming possible delays will be conditioned to genetic and environmental factors, which also refer to social stimulation and interaction, as explained. Thus, several factors can interfere in this development we know that the more stimuli is given to the brain, the more physical activity is performed, the more attention and relational experience is provided to the person, the more he will develop. Luria (1991, 1992, 2001) affirms that a child who lacked experiences and stimulus can have delay on his speech, reading, singing and dancing. He affirmed that it is essential to children to have shared experiences with adults to enhance language and communication.

Therefore, according to Glozman (2014), even if there are limitations and difficulties, it is always possible to advance in development and overcome difficulties. She emphasizes that it is never too early nor too late to start a remediation process. The intervention in the early age is very efficient due to the window of opportunity regarding the neuroplasticity of the brain. If difficulties are noticed the sooner, they can be addressed by the stimulation needed, the better.

In this way the author states that the social historical approach in neuropsychology looks for the origin of the human conscience within the social human life. Therefore, it is fundamental to consider the function of social behavior.

### **Brain Maturation**

Luria (1981) mentions that it is important to analyze deeply the zones which work in the brain, that regulate complex forms of mental activity, to certify the place of each functional area on the system and the proportion of the change of these zones which work together in the brain to establish the mental activities in the different stages of development.

The maturation of the brain and the development of the superior mental functions should be considered in terms of a structural-functional organization of the brain. In one hand the appearance of differentiated brain structures and neuropsychological mechanisms for its actions and in the other hand the formation of mental processes as systems that constitute several components in which each one executes a specific task within the mental functional system (Glozman, 2014).

The author postulates that different brain structures reach maturity in different ontogenetical stages, therefore in each age there are neurophysiological conditions of development and execution of the mental functions corresponding to the potentials of the child. Although there are some guidelines and parameters of development expected on each age, we have to remember that each child is different one from the other.

Glozman (2014) cites Korsakova who explains that the relation of the brain and mind during ontogenesis is not linear, but circular in its nature. The body permits the functioning which influences the development of the body and the expansion of a big range of abilities. The formation of mental functions consists in discovering the equilibrium and the interaction between brain structures during the maturation process and mental functions that develop based on these brain structures.

So, the acquisition of these functions which are considered higher because of the immersion in culture, start during social interaction and become an individual mental function. In this way we understand that biological factors, which are natural and related to physical maturation, and social factors, which are immersed into cultural determined processes, are interrelated and interdependent and that the environment has an important influence on the formation of mental functions as well as stimulate the maturation of brain structures (Glozman, 2014).

In this way the author points out that the development of the child is gradual, periods of relative stability and equilibrium alter with periods of functional jumps, a transition to a new stage of maturity. The most active connections among various places of the functional system occur in the critical or sensible period of development and are consistent with the quality of behavior and mental reconstructions.

According to Vygotsky (1934/2003), the child in his developmental process uses the same forms of behavior that other people initially used in relation to him. From the first days of life, this happens based on the activities that he/she experiences and that acquire their own meaning in a social behavior system, evidenced in their cultural environment, which helps them to meet his goals. Therefore, through social life, the constant communication is established between children and adults, and the experience of many generations is passed on and incorporated in the formation of thought.

The author states that since birth, man already lives as a developing social being and all his actions happen because there is another social one. Even before acquiring oral language, the child is already interacting and becoming familiar with the environment in which he lives. In this sense, learning does not happen in an isolated way, the individual is part of a social group and, as he lives with other people, exchanges information, builds his knowledge and inserts himself in the symbolic world.

Higher psychological functions — perception, language, memory, attention, psychomotricity, reasoning, executive functions — of socio-cultural origin, arise from elementary psychological processes — such as sensation, of biological origin — through the child's interaction with more experienced participants of culture. In this interaction, the child is given the opportunity to internalize symbolic mediators and the social relationship itself. Thus, from elementary organic structures of the child, basically determined by maturation, new and more complex mental functions are formed, depending on the social experiences through which the child has undergone (Vygotsky, 1934/2003).

The author emphasizes that the acquisition of knowledge occurs from the interaction of the subject with the environment within a cultural historical process. Through the mediation process, the subject acquires knowledge when in relation to the environment. In this sense, the relationship between human development and learning is associated with the fact that human beings are in constant interaction with the reality around them and the environment, leveraging both development and learning. Thus, immersion in a social universe promotes development in general as well as the internalization of concepts, configuring an internal world, generating a man who alters his biological dimension, making him symbolic, constituting a singular, historical and social subject.

Bock, Furtado, and Teixeira (2008) state that for Vygotsky, man is not seen as being passive in society, but as an active human being in interpersonal and social relationships. Man acts on the world and transforms social actions. In this way we understand that everyone learns, however in different ways, it depends upon the environment, the culture, the social and the symbolic environment in which that person is inserted.

Therefore, for Vygotsky (1962/1994) social interaction play a central role in human development and in the internalization process, since the path between the object and

the child always passes through and is mediated by another person. In this sense, interaction plays a fundamental role in the development of the mind. From the interaction between people, learning processes are established and there is an improvement of mental structures that exist since birth. Human development occurs during a gradual appropriation and internalization of cultural practices that are shared between people who are immersed in the same culture.

In this development process, the human being needs to establish contact with other people, in a dynamic process, to develop new ways of understanding the world. In this way, the social Other is extremely important and significant for children, as he assumes the role of one who can serve as a reference, helping in the transformation and development of these children.

Luria postulated that the brain is a highly differentiated system and that its parts, together and interacting, are responsible for aspects of the whole. This information is different from what was thought in previous studies, based on localizationism, when each different part of the brain was responsible for a certain function. In this way he did a didactic separation of the five stages of development in order to have a better understanding of this complex machine (Bork, 2017).

According to A. M. Jr. Horton and A. M. Horton III (2008), Luria's five stages of development are:

- first stage: is the first to occur in life, the development of the structures of the lower brain stem, which determines the activation of the reticular system;
- second stage: refers to the activation of the sensory areas;
- third stage: deals with the individual modalities in the areas of secondary association of the brain, that happens when the child is in preschool and is already able to reproduce symbolic materials;
- fourth stage: begins in elementary school and in this phase environmental stimulation is particularly important;
- fifth stage: begins in adolescence, it is when we observe the development of abstract thinking, the execution, monitoring and evaluation of complex learning behavior.

As we can see, there is a gradual development, where each of the different stages is fundamental for the development of the next phase, and therefore, it is necessary to be very attentive and provide precise orientations for parents and caregivers to stimulation appropriately.

### **Zone of Proximal Development**

Vygotsky (1962/1994) explains the zone of the proximal development in which someone who knows more helps and promotes the passage from a level of potential development, when the child still needs help, to real development, when the child is already able to do the activity himself. Joenk (2002) paraphrases this concept by emphasizing that this

zone is divided into these two parts: real and potential. What the child is able to do with the help of an adult is within the potential part because it enables to recognize the process of development until that moment of life including the maturation processes and those which are still developing; and the real zone is the observed capacity of what the child can do by himself, his competency, which is not always so clear.

The zone of proximal development can be different in each age period defining specific characteristics of development of the child which should be taken into consideration in the individual process of learning.

Bork (2017) points out that Vygotsky affirmed that it is necessary to first occur the neurological maturation for learning to occur as a consequence of it. But we understand that within the interaction, learning already happens interfering directly on the process of maturation. The process of maturation, interaction and construction happens all together during development. In this way, it is important to promote learning experiences and stimulation at all times enhancing cognitive development.

This stimulation and the enhancement of development can occur within public areas such as gardens or squares in different parts of the world. We were able to participate of a community experience in Cuba which provided shared shantala and free bond meetings daily in a public square to all community. Shantala is a massage technique used to stimulate, relax and also provide proprioceptive body experience to the baby, but more than that it gives opportunity for relational exchange. As an adult touches the body of a baby, he relates with him in a tender and affectionate way as well as talks to the baby stimulating communicative experiences as well.

We understand that this kind of initiative is very important and nice and it could be established in other public places around the world. We believe that parents do not have to be experts or even know about all theories of development to help the development of their children, they just have to be there, alert and providing attention and feedback to the child's initiative. Trained professionals can help to indicate the next step of development of the child emphasizing only the need for the parents to be present within the relations. Be able to look at this baby and be the external resource and trustful significant Other that will provide conditions for him to develop. Little by little this baby will organize all the experience lived externally as an internal part of his own self.

This statement uses didactically the principles of mediation and zone of proximal development. Considering that relations are the key for this development of superior mental functions it is important to orientate parents, teachers and community itself so that conditions are provided, with knowledge and conscience, for this development to occur. In this way it is really important that the parents, or who takes care of the baby, understand the principles of the zone of proximal development, so that they will be able to promote a better development for the child.

The school, community programs and family itself serve as mediators of knowledge and education. Well prepared teachers, facilitators and caregivers will work in zone of proximal development to complement and promote the development of children. That's



why it is so important for them to understand deeply these studies and have this knowledge to use it on helping the babies and children to grow healthy and adequately develop.

### **Baby — Mother Relation**

Winnicott (1935/1978), in his work, points out the importance of the relationship between a baby and his mother. The author brings us the concept of a good enough mother. This mother is the person who presents the world to the baby, welcomes and sustains him, but also makes mistakes, which must be gradually borne by this child, who learns to deal with the failures of the environment. The good enough mother is the person who gives support to the child. The author often states that is important that it is the mother who gave birth to this child because she will have an internal preparation and a connection both with her feelings and with her baby that grew inside her.

According to Winnicott (1935/1978) this can be performed by a responsible adult, who takes care of this baby and gives him the necessary support. This adult stays with the baby in a dedicated and constant manner. This commitment cannot be distributed among several other persons because she must be the one who will be the reference.

A sufficient good mother promotes conditions of trustfulness which permits the baby to feel secure so that he can integrate and constitute himself in the world. This trust established in a facilitating environment promotes a healthy development (Winnicott, 1935/1978).

It is through this interaction that babies develop and this is what gives them emotional structure. It is possible to refer, within the emotional aspect, to Vygotsky's relational approach and his concept of zone of proximal development. In the field of development within this zone, the adult must do externally what will gradually be built internally, according to the baby's conditions throughout his development. Learning takes place in a process, until the baby can build inside what has been presented externally.

We can draw a parallel and understand that the support given to the baby from this adult caregiver, for example, in the case of dealing with the failures that need to be lived, can be received by him to the extent that it is possible for him to deal. When it is not anymore possible, it would be the role of this caregiver to lend to the baby an external support, while he is still not able to cope with it and over time, he will build this internally. This construction, according to Winnicott, is the construction of the mental world of babies.

When we think about the human being, we conceive the idea that we are integrated human being, however, according to Winnicott (1935/1978) this integration is built. At the beginning babies are in a state of non-integration. The integration process takes place in the relationship between the baby and the environment including the way the mother holds and supports him and transmits her emotions while she is doing so.

Winnicott (1935/1978) calls this holding and he uses another term to explain when the mother gives support to the baby, it is called handling. These concepts are much more complex than just physically holding the baby. The integrated and emotional constitution



is based on corporal and good child care. We can understand that the mother will be the one who carefully presents and decodes the world to the child. All the information and stimuli that comes from the external world will need to be understood and decoded by the internal world (it's the same process that we usually think about when we talk about the proximal zone of development), the mother will help her baby in this process. There's no way to think about the human being without realizing how much this exchange between the external and internal world, both regarding psychic and cognitive construction, are processed. They are intertwined and occur simultaneously and one completely interferes on the other.

Bowlby (2002) considers that a child experimenting a positive maternity will have an adequate brain structure, will develop a safe system of attachment and will have trust internalized. This way the child will be able to have a relation with the world in a trustful way, with courage to face the challenges and dangers that will arise while he is brought up becoming resilient. Resilience suggests flexibility and elasticity to deal with adversities and get over them reaching good results independently of the events of life and of circumstances.

### **Orientations to Parents Regarding Early Childhood**

Considering the importance of this bond Anauate (2017) suggests some simple and basic, but very important, orientations that are not always carefully performed by parents and caregivers. It is fundamental for them to have these orientations in mind when interacting with a baby:

- be very attentive to all initiatives of the baby and return them showing that you are present within the relation;
- hold the baby tidy to pass security;
- look and smile to the baby in all times;
- emphasize the emotions that emerge giving names to them;
- be complete within the relation playing with the baby in shared experiences;
- touch the baby and name all the parts you touch;
- when the baby does a gesture or points to something look at where he is pointing and name it showing you are aware of his demands;
- when the baby emits a sound repeat the sound back to the baby, do a baby talk and name the sounds and gestures back to the baby and include the parents, brothers and sisters in the care with the baby, the more he has opportunity of relational experiences, the better;
- it is important to look at the baby as a unique human being, considering his rhythm and reach him in his needs. As the baby looks in his mother's eyes, he sees himself reflected back as a unique human being.

Considering all these points, when thinking about babies from a young age, it is essential that there is always an interaction between the adult and the baby with proximity

and eye contact. Shantala massage, which involves both, is very important providing skin contact. Other stimulation can also be done in each distinct stage of development of the child. When we consider that all brain functions are supported by the sense organs, the more areas we stimulate, such as doing activities that stimulate attention to sounds, kinesthesia, visual stimuli and olfactory stimuli, the better. It is also important, with regard to auditory and even emotional stimuli, recalling Winnicott (1935/1978), that the baby's caregiver, in addition to the activities performed, talk to him, be affectionate and give name to what is being experienced. As the baby develops, we can add other activities that respect his development and stimulate him in a way that reaches his possibilities, in the phase in which he is in at that moment.

### **Luria's Functional System and Orientations to Caregivers/Teachers**

Caregivers can stimulate babies based on studies proposed by scholars such as Vygotsky, Leontiev, Luria and those who had these authors as inspiration. It is important to understand the expected stages of development of a child and consider the particularities of each one and in this way manage to develop to the fullest of their potential.

Strategies will be pointed out in this article so that the teacher, facilitator or family can provide for a better development of the superior mental functions of his pupils. It is important to emphasize that significant relation and interpersonal contact promote development. Consider that each individual person has different characteristics of personality. Teach each person individually because they are different people therefore unique and particular. Respect the initiatives of each person and try to respond to them always leaving a pause for the next initiative to emerge.

Leal (2003) suggests to work in a go-and-come-back rhythm in which there is an initiative from the child that will be responded and then a pause will be given so that a new initiative can occur. Look the person in the eyes and be sensible to his needs. Propose a team work where two people work together, people working together exchange information and practice relational experiences.

Leontiev (1975/1978) affirms that all activities proposed should have a meaning to the person who is executing them. The activities should be driven to a specific objective already foreseen by the parent, teacher or caregiver. Meaningful activities are more easily internalized because they make sense to the person who is assimilating them.

Well orientated teachers, facilitators and family should use strategies to promote the development of the three functional units or blocks of Luria (1981) (see *Figure*).

The first block is the activation block of the cerebral cortex, it is responsible for the supply level and constancy of energy, keeping it stable. This area provides energy to work. It includes non-specific structures of different levels: reticular formation of the brain stem, non-specific structures of the diencephalic region, limbic system, medial basal areas of the frontal and temporal cortex and other subcortical structures. This unit

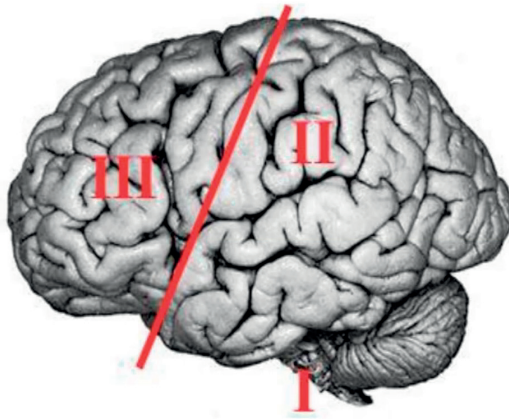


Figure. Luria's Functional Blocks

regulates two types of activation processes: general activation of the brain and changes of local selective activation (Glozman, 2014).

Exercises such as physical activities are recommended! Several psychomotor exercises should be done to promote attention and activation of the brain. Exercises as: "Simon says touch your nose... Simon says touch your elbow... Simon says put your hands up... put your hands down." Another movement exercise to activate the brain of a child is "head, shoulder, knees and toes, knees and toes..." Then take away the words and just do the movements.

Another play activity that works with brain activation is called — *guess where?* (it is a typical Brazilian game), in which children sit in a circle, all must look towards the center, one of them stands outside and must walk around, or even go dancing around that circle singing the song of the game. The child has an object in his or her hand that will put behind one of the children sitting in the circle. At some point the child who is walking should drop the object behind a person and stop singing, which will be the sign that he has already left the object and the other child, who has the object behind him, must get the object and run after the other child until he catches him or until he or she sits himself in the place of the one who got up and then the game must start again. If the one who dropped the object is reached, he must do everything again, if he or she is not, then the other one starts the game again.

Hard or soft is another game in which children stroll in the park, or in the classroom. When the teacher speaks the word hard, everyone must keep their body and muscles very tight, so when the teacher tries to raise, for example the child's arm, she will not be able to due to how hard it is. After the teacher will say the word soft and all the bodies must be very relaxed.

Another game is the game of chairs. In this game the children and teacher must arrange the chairs in a straight line, putting one seat facing one side and the next seat facing the other side, and so on. The number of children must always be one more than the number of chairs available. The game starts with the children walking or dancing

around the line of the chairs, previously assembled, to the sound of music. When the music stops, everyone should try to sit in a chair, there will always be a child left without sitting, the game will continue until there are two children and one chair and one of them will be left without a chair. These are just a few suggestions to activate the cortex in a pleasant way through the use of games or activities.

Memory exercises such as: "John went to the fair and bought an orange..." and the next person on the circle or on line will continue saying: "John went to the fair and bought an orange and a pear..." and so on. All these exercises, both physical and mental, activate the child's brain promoting a good field of attention to enhance learning abilities.

The second functional is localized on the posterior part of the brain including the following lobes: parietal, temporal and occipital. This unit is responsible for the reception, processing and storage of information that arrives from the outside world. The parietal lobe is responsible for identifying tactile sensory impressions, the temporal lobe is responsible for identifying auditory information and the occipital lobe is responsible for identifying visual information.

Information, or input stimuli come from the outside world through waves of physical energy which are transformed into chemical energy when they enter the body and are transported to the brain straight to the thalamus, the only exception is for olfactory information which goes straight to the olfactory bulbs for recognition. The thalamus distributes the information to the specific lobes cited above for identification and perception. This process is called transduction.

It is important to use all these areas and stimulate all of the senses of the children. All of them together will help on the codification and storage of the information in the memory. Repeat all the information given during the activity to encourage the persons to participate. The teacher, facilitator or family should do a "to do list" of the day and as he gives the activity fill in the list with information so that the people will have all the important information of that day in a systematized and organized way for posterior study and/or recall.

Activities such as exploring the reception of external stimuli and recognizing them can be a lot of fun. Among these we can play with blindfolds to identify sounds and where they come from as well as work with tactile perceptions such as which is cold, hot, dense, soft or even gustatory stimulation.

In relation to visual stimuli, activities that involve differences in color tones, perception of differences in figures such as the game of the seven errors, where we compare two equal figures with differences that can be more or less subtle according to the age group. The teachers can use situations with different types of illumination, such as, light and dark, using flashlights, when stories are told that working with creativity and curiosity.

Other interesting activities can be done such as manipulate different textures with varied sandpaper, from the finest to the roughest, always with great care so that the child does not get hurt, or even make use of a bowl for materials such as gel, water, flour, cream, among others. Materials for manipulation and construction of shapes also can be used such as: homemade clay, which can be worked by the children themselves with edible items (flour, filtered water and food coloring).

The third functional unit located on the frontal lobe is the unit responsible for the organization, regulation, verification, planning of the mental activity, as well as the anticipation of the action, problem solving, correction of errors and postponement of impulses — it is the core of the executive functions. The proper interaction of the three blocks with the environmental stimuli culminates in the high cortical functioning which will be perceived through language, memory, intention and abstract thinking.

The use of games and activities to stimulate the thought and the planning from a psychomotor point of view and also to improve cognitive aspects are important. Before you do a motor exercise or speak you have to plan all the details of your action and this third part of the functional system is responsible for doing it.

Some advised games which work the executive functions are: chess and mastermind, which need planning sequencing, concentration and non-verbal comprehension. They are interesting activities to use regarding executive functions. Other possibilities are Set and Sudoku which explore the visual perception to discover patterns and train problem solving abilities. Another interesting game is Panic Lab which trains mental flexibility requiring close attention and reaction.

We also suggest other activities which practice control and inhibition, such as stop and go exercises. Body movements have to have planning and are also important for control, orientation and for interhemispherical interactions. These exercises can be done at school or with private professionals such as speech therapists, neuropsychologists, psychologists, private teachers, etc.

Luria (1981) affirms that the brain works as in a concert, all of the three units work together forming the Functional System. One unit helps the other in an interdependent way.

## **Learning Disabilities and Emotional Reactions**

According to the DSM-V (American Psychiatric Association, 2014), learning disabilities is a kind of Neurodevelopment Disorder that impairs the ability to learn or use specific academic skills, for example reading, writing or arithmetic. Based on DSM-V this kind of problem may appear in preschools, but it's easier to diagnose when the formal school starts.

Learning disabilities are very common to be present in children's lives. It happens by something that affects the brain development and it could start before birth, during the birth or after, it could be also a combination of more than just one cause. The causes are biological, most of the times, genetic, and social. Some of the common learning disabilities are: dysorthography related to writing skills and also dysgraphia in which, according to Di Mauro, Bevilacqua, Colizzi, and Di Pierro (2020), is a learning disorder that causes difficulties in reproducing alphabetical and numerical signs. Children with this disability write irregularly, it is very usual for them to write in an inadequate body position, with their elbows not placed on the table and they incline their back. Dyscalculia is related to math skills, and according to Kaufmann and Aster (2012) is a difficulty asso-

ciated to the acquiring basic arithmetic skills which is not explained in any way through low intelligence or inadequate schooling and the child can't get better without treatment. According to these authors, difficulties to write, read and learning mathematics are common disorders in children. Dyslexia is related to reading skills and are mainly referred to as the difficulty on the ability of learning how to read (Petretto & Masala, 2017), and it is the most studied learning disability. According to DSM-V (American Psychiatric Association, 2014) there are three differences within the concept of ADHD: with attentions symptoms priority, with impulsivity and hyperactivity or with both together. In all of these cases the symptoms must have persisted for six or more months, with negative impacts in both social and academic activities. It must start before 12 years old and it should occur in every place or situation within the child's life and relations: at home, with friends or relatives and at school. In all these cases it has to be related to attention skills, as well as laterality difficulties and difficulty with the organization and planning of the activities: executive functions.

These learning disabilities can lead to, and they frequently do, emotional disturbances. Barreto, Freitas, and Prette (2012) correlate social skills and learning disabilities. Children with difficulties present high frequency of performance indicating internal and external problems according to their own teachers. Developmental disturbances are related to affective-emotional aspects which can be a result of the learning disabilities or of adverse conditions of life on the child's relation with the world around. These can develop: anxiety, attention deficit, depression, etc.

The fundamental is that the teacher and facilitator is alert to the emotional signs given by the person so he will be able to help, these signs that can be showing, among other things, domestic violence. Everybody is responsible and it is the main role of the teacher and facilitator to provide conditions for the pupil to advance and progress. Be alert also to direct the pupil, the sooner the better, to an indicated professional, so that the person suffers the less damage possible.

Reactions such as aggressiveness, cry, quietness, as well as agitation, difficulty to pay attention, etc. can be signs of affective-emotional disturbances. When the caregiver notices something, it is important to talk to the child. Create a bond of trust so that you are able to help the child to speak about his sorrow. Remember that a child, most of the times, stays more time with the teacher, during the day, than with his own parents, therefore attention to the emotional attitudes of the child is fundamental.

The brain develops better within a stable environment of support and low levels of stress. Safe relations are the key to healthy development of the brain as well as emotional regulation that encourages learning and adaptation to reality. It is very important to produce a cozy and welcoming environment so that the child can establish significant relations to consolidate himself as an autonomous and capacitated being which builds significant subjective concepts in life. We understand that it is very important that teachers and facilitators permit children to be authentic, truthful and that they have their decisions respected always within parameters and limits previously established. This has the objective of forming an original and spontaneous human being.



Cozolino (2013) postulates that relationships are fundamental for the formation of the brain, which is always social — it does not form with its multiple powers without significant human interactions. Therefore, for the relation of teacher and students it is important to emphasize the care, respect and attention necessary within this bond. The insertion in a qualified environment with significant adults promotes the humanization of these babies, that is, it helps in the constitution with a historical and cultural subject. We understand, therefore, that the brain's functionality is closely related to our social relationships. Thus, the brain, as a social organ, corroborates the fact that the influence that relationships have on the health/disease dialectic, on neuroplasticity, on learning, among other things. The ability to learn, in itself, connects our brain and our bodies to our physical, emotional and social survival.

### **Education and Remediation**

Glozman (2014) explains that an education which remediates determines development. She points out that remediative and formal education has two objectives which differ. General education relates to the acquisition of knowledge and remediative education is related to the formation of functional organs or of a new functional system that permits mental process to be done. For a child with learning disabilities it is important to do a remediative process prior to formal education so that a base is built for further education because new basic functional systems are formed during remediation that will allow future independent learning. The role of the neuropsychologist is not to teach school subjects, but to work on the formation of higher mental structures, which will provide conditions for formal school learning.

The basic systems cited above include voluntary regulation, control of child's own behavior, spatial orientation, verbal phonemic and kinesthetic analysis and synthesis, motor ability, volume and stability of visual and verbal memory as well as logical thinking and communicative abilities (Glozman, 2014).

The cultural-historical approach in neuropsychological remediation of learning disabled children consists of further development of the theory of mediation. Vygotsky proved that mediation is a natural way of cognitive development in children and of the psychological compensation of cognitive and physical deterioration in children. This last principle results in a search for mediation methods in remediation instead of direct training of underdeveloped functions (Glozman, 2013, p. 156).

Therefore, the main task of remediation according to Glozman (2014) is to create, together with the patient, who actively participates during all the process, ways to compensate and overcome the underdeveloped mental functions. During remediation we must use the strong brain structures to stimulate the weak ones. The activities proposed should be playful and interesting to motivate the child, bringing legitimate results.

Remediation, in this sense, is a holistic process, in which flexible strategies should be created according to the child's psychological age and type of difficulty as well as external



orientation should be provided by an adult. These strategies must be based on the concept of the zone of proximal development and include the general activity and the personality of the child (Solovieva & Quintanar, 2015).

Neuropsychological remediation consists of two complementary orientations of work with the child: the first aims at forming a basic framework for cognitive functions, the second at the development and remediation of cognitive functions and their components. Both orientations include effects on emotional and personal aspects of the mental activities of children (Glozman, 2013, p. 149).

The principles of remediation according to Solovieva and Quintanar (2015) are related to: gradual formation of weak brain mechanisms using the strong mechanisms as a base; inclusion of weak mechanism in orientated actions with goal and motive; take into consideration the psychological age and the rector activity instead of the chronological age; through mediation, starting with the external level, gradual internalization of actions; constant orientation and mutual dialogical and interactive cooperation within the process of remediation.

In Glozman's (2013) point of view, neuropsychological remediation is a form of child's social protection. It is based on Vygotsky's and Luria's principles as follows:

1. An assessment reveals deficits and strengths of his development plus the zone of proximal development and the possibilities to improve results with the help of the examiner characterizing Luria's principle of using dialogue in the assessment.
2. The complex remediation combines cognitive, motor, respiratory and emotional methods in order to form a mental function.
3. The systemic remediation relates to a program organized for the child focuses on the balance of the whole personality of the child.
4. Play activity in which the child is a subject of appropriation of a play experience. It unites affect and intellect and releases tension increasing the overall activity of the child raising his potential promoting awareness of the action.

The process of remediation's goal is to accomplish the following tasks: improve behavior and school performance by enhancing cognitive development, remediation of negative personality traits, development of communicative skills and psychological intervention to assist parents. Remediation should promote opportunities for achieving cognitive health developing a person as a whole. In this way parents should understand the importance of the remediation task and what the professional who are working with their child is doing because it depends also on this the success of treatment.

Glozman (2013) mentions Soboleva who considers that the formation of high mental functions in the play remediation goes together with the improvement of school achievement developing both emotional and communicative abilities. Luria's studies confirms this statement and adds that brain activity shows the value of communication to the mental development of children in which language is one expression of reality (Luria, 1991).

## Conclusion

When you are present in a relation nervous connections are promoted. Results are observed qualitatively focusing that each person is an individual self and that relationships are essential to produce development. Interactions between the brain and the formation of mental functions require the maturity of the nervous system as well as an active process which emphasizes relations of two or more human beings.

Lashley (1920): affirms that engrams (traits of memory) produce changes on the brain associated with long term memory. Two possible changes are: the *functioning of the neuron can alter with chemical changes* — there is an increase on the quantity of neurotransmitters produced by the neuron and the *structure of the neuron can be altered with physical changes* — the number of ramifications which interconnect the neurons increase, this way increasing the number of synapses or points of communication of each ramification.

Therefore, we believe that the more stimulation given to the brain, the more physical activity is done, the more attention and relational experience is provided to the person, the more he will develop overcoming possible delays and underdevelopment. Luria (1991, 1992, 2001) considers that the experiences lived by the child from 0 to 3 years has potential force in brain development.

The family and school, with their significant adults, will act as mediators, promoters of interventions aimed at advancing, progressing, going beyond. Respecting the pace and stage of each one, attentive, participative and committed, but most of all, affective adults can provide qualitative leaps in the learning, social and emotional skills of a child resulting in neuropsychological development.

As we have written during our text, all the adults that interact with their babies and children should understand the importance and the responsibility of this relation between them and the child regarding brain development, the emotional well-being and the psychic health of this child.

In this way we believe that the most important is how you relate to the person and not only what you do. A team work among school, community and family is fundamental. Parents, teachers and community in general, such as the work done in public squares in Cuba, should establish a good relation with their people, children and students, considering them as unique individuals providing development to occur. Parents and teachers with a good orientation and interested on the well-being of the child are able to promote a holistic health to the child which will include: a healthy environment, a healthy community, a healthy infrastructure, a healthy family, forming a healthy individual.

Bock, Gonçalves, and Furtado (2002) considers, within a Social Historical point of view, that man which experience relations transforms and is transformed in a constant process. In this way we believe that human interaction involve exchange, in both ways, one human constitutes the other, transforms the other, in a dialogical process which focuses the best way to promote holistic health and adaptation to reality.

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*Original manuscript received April 02, 2020*

*Revised manuscript accepted July 09, 2020*

*First published online November 13, 2020*

**To cite this article:** Anauate, C., & Bork, B. (2020). Promoting neurocognitive development in childhood. *Lurian Journal*, 1(2), 11–29. doi: 10.15826/Lurian.2020.1.2.2